

DIG64 Technical Whitepaper: Managing The Legacy Transition In IA-64 Servers

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Overview

Today's server platforms retain legacy technologies that have no place in the IA-64 world. Fortunately, the current development of IA-64 servers provides the necessary catalyst to trigger the elimination of holdover technologies that date all the way back to the original PC-AT platform.

While we're eager to eliminate legacy performance and support burdens from IA-64 servers, it's clear that technology migration needs to be carefully managed. The Developer's Interface Guide for IA-64 Servers (DIG64) meets these objectives by providing a well-defined roadmap for legacy removal.

DIG64 specifies what legacy removal steps are required to support servers based on the Intel® Itanium™ processor. Additional technology migration steps are recommended, and some are merely optional, letting OEMs set their own pace. As the DIG64 specification evolves, it will extend the technology migration roadmap to systems based on future IA-64 processors.

What Is a Legacy?

What exactly is a legacy technology? The working definition of a legacy is "a function that is used solely to support compatibility with older technology." Examples of legacy technologies now found in server platforms include serial ports, parallel ports, keyboard and mouse ports, floppy drives and the venerable ISA bus.

In the 64-bit world, many of these older technologies have simply outlived their usefulness. The performance of the Intel Itanium processor needs to be balanced by other platform building blocks. Buses and I/O ports that were once part of the original PC-AT architecture can no longer keep pace with the I/O and system-level performance demands of IA-64.

In fact, many of these same legacy technologies are already being removed from IA-32 desktop PC platforms, as part of the legacy removal roadmap that, in turn, is a part of the Easy PC initiative. Unlike Easy PC, DIG64 does not address packaging, form factors or environmental design.

A Legacy of Problems

One of the major reasons for eliminating legacy platform technologies is that they do not scale with IA-64 performance levels. Platform building blocks such as the ISA bus and serial and parallel I/O ports that were created for the PC-AT architecture have slower clock rates and narrow data paths, and they do not support dynamic resource allocation.

ISA, in particular, is well past its prime. Its non-contiguous memory maps and fixed addresses are inefficient, and ISA slots consume precious real estate on the system board.

As servers move to network-based "headless" operation, VGA technology and human interface device ports for keyboards and mice are no longer needed. When these ports are eliminated, DOS can be phased out of utility applications used for manufacturing support.

Finally, add-in cards whose Option ROMs contain hooks to system BIOS can create needless support headaches. This technology is migrating to abstraction layers in firmware.

About DIG64

Legacy removal in IA-64 servers is defined in the Developer's Interface Guide for IA-64 Servers (DIG64), an interoperability guideline based on a standard set of system building blocks and software interfaces. DIG64 is supported by an industry working group that includes: Compaq, Dell, Hewlett-Packard, IBM, Intel, NEC, and Siemens, together with: Adaptec, American Megatrends, Bull, Interphase, LSI Logic, Mylex, Novell, Oracle, Qlogic, Phoenix Technologies, SCO, TurboLinux, and Sun Microsystems.

DIG64 covers system building blocks including the processor, memory, chipset, I/O bus and system management, in addition to interfaces to peripheral devices for communication, networking and storage. DIG64 also addresses low-level firmware interfaces for system configuration, boot and run-time services. One of the most important aspects of the guideline is a roadmap for technology migration, including managed legacy removal from IA-64 platforms.

What Is EFI?

A key component of the DIG64 guideline is a firmware abstraction layer known as the Extensible Firmware Interface (EFI). EFI includes a set of data tables that contain platform-related information in addition to boot and runtime service calls that are available to the operating system and its loader.

EFI abstracts the BIOS from the OS, providing a modular and extensible interface that allows compatibility between IA-64 hardware and operating systems while enabling developers to add new security, manageability and diagnostic features. Leading IA-64 operating systems are now

being developed with EFI. One of the outstanding benefits is that EFI fully initializes the system through the use of independent drivers, insulating the system from the legacy technologies of the PC-AT era. In the future, EFI will give hardware vendors the opportunity to drop legacy support in the Option ROMs on adapter cards.

Legacy Removal Roadmap

Here's a capsule summary of DIG64 guidelines for legacy removal:

- ISA expansion slots must not be included or supported. No embedded ISA adapters can be used for networking storage or graphics.
- An EFI boot-loader for 64-bit operating systems is required. The EFI pre-boot environment is recommended, as is EFI Option ROM support.
- Support for IA-32 operating systems, DOS*, and Windows* 98 is optional. This means the IA-64 platform is not required to support these operating systems. New 64-bit operating systems should not depend on legacy hooks. During the transition period, DOS may be used to support manufacturing tests and required utilities. DOS will eventually be replaced by an EFI-based pre-boot environment.

DIG64 includes optional support for legacy I/O ports and VGA. Developers should plan to use IDE, USB, and EFI abstractions. Serial, parallel and OS/2* ports should all be replaced by USB technology.

Benefits for Developers

Joining the DIG64 industry group is the best way to keep pace with legacy removal and ensure that the IA-64 products you develop maintain compatibility with essential hardware, firmware, and operating system platform building blocks.

As an adopter member of the DIG64 industry group, you are eligible for the following benefits:

- Participation in DIG64 interoperability events
- Promotion of compliant products on the DIG64 Web site and at DIG64 events
- Agreement for granting any licenses that may be required within the DIG64 guidelines

The bottom line for developers is that the retention of legacy architecture adds needless complexity to the design of IA-64 servers. This can not only stifle technical innovation, it can also add considerable engineering effort, cost and time to the development process. DIG64 is an opportunity to make a clean break with the past.

Summary

The adoption of IA-64 in servers provides the catalyst needed to accelerate the legacy removal process, and the DIG64 guideline provides a clear-cut roadmap.

DIG64 requires the elimination of ISA slots from IA-64 server platforms, with I/O shifted to PCI.

In addition, DIG64 currently recommends the replacement of serial and parallel ports with USB technology. System I/O (SIO) technology will follow ISA out the door as servers move toward “headless” network-based management.

Finally, the incorporation of the Extensible Firmware Interface architecture, an abstraction layer which shields platform firmware from the operating system, promotes interoperability and enables the elimination of antiquated DOS-based utilities.

By following the legacy removal roadmap included in DIG64, server developers can prepare for optimal performance. At the same time, their designs can benefit from improved interoperability and reduced support costs.

More Information

The current version of the EFI specification is now available for download from the Intel EFI Web site.

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